

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Abdulsalam Al-Mayahi
Serial No. : 10/566,389
Filing Date : May 26, 2006
Title : Solvent Removal Process
Group Art Unit : 1797
Confirmation No. : 3744
Examiner : Ana M. Fortuna
Attorney Docket No. : BOU-36620

**SUPPLEMENTAL DECLARATION OF DR ADEL SHARIF
UNDER 37 C.F.R. §1.132**

I, Dr Adel Sharif, the undersigned Declarant, do hereby state and declare that:

1. From June 1998- to the present, I have been employed with the University of Surrey, UK. In my current position as Director of Centre for Osmosis Research & Applications, I am responsible for teaching and leading research in the area of osmosis science for applications in desalination and renewable power generation. I received my B.A. in Chemical Engineering from University of Baghdad, Iraq in 1986. I received my Ph.D. in Chemical Engineering from the University of Wales Swansea in 1992. I am one skilled in the art of the instant patent application.
2. I am intimately familiar with the above-referenced patent application (the '389 application). I am an inventor to the '389 patent application.
3. I have read the Examiner's Office Actions dated October 8, 2009 and May 24, 2010; International Publication No. WO97/18166 to Herron et al. (*Herron166*); U.S. Patent No. 4,781,837 to Lefebvre (*Lefebvre*); U.S. Patent No. 5,755,964 to Mickols (*Mickols*); U.S. Patent No. 5,281,430 to Herron et al. (*Herron430*); and U.S. Patent No. 5,098,575 to Yaeli (*Yaeli*). The patent publications are hereafter collectively referred to as *the cited references*.

4. The solutes listed in present claim 42 do not cause membrane fouling or scaling. We create the second solution by dissolving a solute selected from $\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$; $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$, $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$; $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$, $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$, potassium alum. $24\text{H}_2\text{O}$, potassium chloride, sodium chloride and $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$. As can be seen from the solubility data below, these salts are highly water soluble.

Salt	Solubility in Water
Hydrated Magnesium Sulfate	710 g/l
Hydrated Magnesium Chloride	1570 g/l
Potassium Alum	368 g/l
Hydrated Sodium Sulfate	323 g/l
Hydrated Calcium Chloride	1000 g/l
Potassium Chloride	344 g/l
Sodium Chloride	359 g/l
Hydrated Disodium Hydrogen Phosphate	218 g/l

5. The salts listed above readily dissolve in water to form our second solution. Accordingly, the foregoing salts can be readily and conveniently dissolved in water to form clean solutions with sufficiently high osmotic potentials to draw water from the seawater or brackish water solution by direct osmosis. At the same time, the dissolved salts are conveniently separated by the second membrane in a manner that does not lead to membrane fouling or scaling. This is because the foregoing solutes form solvated anions and cations in water, which do not precipitate out of solution as solids that form solid deposits on the membrane and cause membrane fouling or scaling.
6. As explained in my declaration dated 16 August 2010, no one would expect that the

second solution formed in the manner described above would foul or scale the membrane. Consequently, no reason exists to add anti-fouling and anti-scaling agents to the second solution. It is our unexpected discovery of the problem of crossover that leads us to add anti-fouling and anti-scaling agents directly to the second solution. None of the *cited references* recognize the problem of crossover, and therefore, none of the *cited references* provide any reason to introduce anti-fouling agent or anti-scaling agent directly into the second solution. In the absence of our unexpected discovery of crossover, therefore, the addition of such anti-fouling and anti-scaling agents is entirely counter-intuitive.

7. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this Rule 132 Declaration is directed.

Dated: 23 September 2010



NAME: Adel O. Sharif